

Appl. No. 10/807,524
Amdt. dated Aug. 18, 2005
Reply to Office Action of May 18, 2005

Amendments to the Claims:

The following listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

Claim 1 (currently amended): An antenna system comprising:

a stacked patch antenna comprising two or more patch antennas symmetrically aligned around an axis, wherein at least one of the two or more patch antennas ~~the stacked patch antenna~~ comprises a differential feed patch antenna.

Claim 2 (original): An antenna system as recited in Claim 1, wherein the two or more patch antennas comprise:

a first patch antenna; and

a second patch antenna, wherein at least a portion of the second patch antenna serves as a ground plane for the first patch antenna.

Claim 3 (original): An antenna system as recited in Claim 2, wherein the first patch antenna comprises a high frequency patch antenna, and further wherein the first patch antenna is frequency sensitive.

Claim 4 (original): An antenna system as recited in Claim 3, wherein the second patch antenna comprises a patch antenna having a lower frequency than the first patch antenna, and further wherein the second patch antenna is frequency sensitive.

Claim 5 (original): An antenna system as recited in Claim 2, wherein the first patch antenna comprises a single-polarization, differential feed patch antenna comprising:

a grounded substrate;

a radiating system coupled to the grounded substrate; and

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a feed system having two feed points for providing a differential feed signal, wherein the radiating system resonates in response to an excitation by the differential feed signal.

Claim 6 (currently amended): An antenna system as recited in Claim 5, wherein the second patch antenna comprises a second single-polarization, differential feed patch antenna comprising:

the grounded substrate;

a second radiating system coupled to the grounded substrate; and

a second ~~[[the]]~~ feed system having two feed points for providing a second ~~[[the]]~~ differential feed signal, wherein the second radiating system resonates in response to an excitation by the second differential feed signal.

Claim 7 (currently amended): An antenna system as recited in Claim 2, wherein the first patch antenna comprises a dual-polarization, differential feed patch antenna comprising:

a grounded substrate;

a first radiating system coupled to the grounded substrate; and

a first feed system comprising two or more pairs of first feed points ~~feedpoints~~, wherein the two or more pairs of first feed points ~~feedpoints~~ provide two or more first differential feed signals, wherein the first radiating system resonates in response to an excitation by the two or more differential feed signals.

Claim 8 (currently amended): An antenna system as recited in Claim 7, wherein the two or more pairs of first feed points ~~feedpoints~~ are orthogonally located with respect to each other.

Claim 9 (original): An antenna system as recited in Claim 7, wherein the two or more first differential feed signals are further combined in phase quadrature to yield a first pair of circular polarized signals.

Claim 10 (currently amended): An antenna system as recited in Claim 7, wherein the second patch antenna comprises a second dual-polarization, differential feed patch antenna comprising:

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the grounded substrate;
a second radiating system coupled to the grounded substrate; and
a second feed system comprising two or more pairs of second feed points ~~feedpoints~~,
wherein the two or more pairs of second feed points ~~feedpoints~~ provide two or more second
differential feed signals, wherein the second radiating system resonates in response to an
excitation by the two or more second differential feed signals.

Claim 11 (currently amended): An antenna system as recited in Claim 10, wherein the two or
more pairs of second feed points ~~feedpoints~~ are orthogonally located with respect to each other.

Claim 12 (original): An antenna system as recited in Claim 10, wherein the two or more second
differential feed signals are further combined in phase quadrature to yield a second pair of
circular polarized signals.

Claim 13 (currently amended): An antenna system as recited in Claim 9, wherein the second
patch antenna comprises a second dual-polarization, differential feed patch antenna comprising:
the grounded substrate;
a second radiating system coupled to the grounded substrate; and
a second feed system comprising two or more pairs of second feed points ~~feedpoints~~,
wherein the two or more pairs of second feed points ~~feedpoints~~ provide two or more second
differential feed signals, wherein the second radiating system resonates in response to an
excitation by the two or more second differential feed signals, and further wherein the two or
more second differential feed signals are further combined in phase quadrature to yield a second
pair of circular polarized signals.

Claim 14 (currently amended): An antenna system as recited in Claim 2, wherein the second
patch antenna is differentially fed via two or more second feed points ~~feedpoints~~ located around
a center point, wherein the center point comprises a zero potential point.

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Claim 15 (currently amended): An antenna system as recited in Claim 14, wherein each of the two or more second feed points ~~feedpoints~~ are comprised of a coaxial feed rod.

Claim 16 (currently amended): An antenna system as recited in Claim 14, wherein the first patch antenna is further differentially fed via two or more first feed points ~~feedpoints~~ located around the center point.

Claim 17 (currently amended): An antenna system as recited in Claim 16, wherein each of the two or more first feed points ~~feedpoints~~ and each of the two or more second feed points ~~feedpoints~~ are respectively comprised ~~comprises~~ of ~~[[a]]~~ coaxial feed rods ~~[[rod]]~~.

Claim 18 (new): An antenna system comprising:

- a plurality of patch elements symmetrically aligned about a first axis, a first patch element of the plurality of patch elements operable to radiate at a first frequency responsive to at least a first differential pair of excitation signals, a second patch element of the plurality of patch elements being separated from the first patch element by a first distance and operable to radiate at a second frequency responsive to at least a second differential pair of excitation signals, the second frequency being lower than the first frequency;

- a ground plane symmetrically aligned about the first axis and separated from the plurality of patch elements by a second distance; and

- a feed system operable to supply the first differential pair of excitation signals and the second differential pair of excitation signals to the plurality of patch elements.

Claim 19 (new): The antenna system as recited in Claim 18, wherein the feed system is operable to split a first excitation signal at the first frequency into a first pair of excitation signals each having an equal amplitude and to apply a phase shift of 180 degrees to one of the first pair of excitation signals to produce the first differential pair of excitation signals, and wherein the feed system is further operable to split a second excitation signal at the second frequency into a second pair of excitation signals each having an equal amplitude and to apply a phase shift of

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180 degrees to one of the second pair of excitation signals to produce the second differential pair of excitation signals.

Claim 20 (new): The antenna system of claim 19, wherein the feed system is further operable to supply a third excitation signal at the first frequency, apply a phase shift of 90 degrees to the third excitation signal relative to a phase of the first excitation signal to produce a quadrature excitation signal, split the quadrature excitation signal into a third pair of excitation signals each having an equal amplitude, and apply a phase shift of 180 degrees to one of the third pair of excitation signals to produce a third differential pair of excitation signals; and wherein the feed system is further operable to supply the first differential pair of excitation signals and the third differential pair of excitation signals to the first patch element at two orthogonal pairs of feed points, the first pair of feed points operable to receive the first differential pair of excitation signals and being positioned symmetrically about a centroid of the first patch element along a second axis, the second pair of feed points operable to receive the third differential pair of excitation signals and being positioned symmetrically about the centroid of the first patch element along a third axis, the first axis, the second axis and the third axis being orthogonal to each other, the first differential pair of excitation signals and the third differential pair of excitation signals collectively forming a circularly polarized excitation signal.